

Appin. No. 10/647,677
Amdt. dated: March 25, 2005
Reply to Office Action dated December 28, 2004

Remarks/Arguments

These remarks are in response to the Office Action dated December 28, 2004.

This reply is timely filed.

At the time of the Office Action, claims 1-20 were pending in the application. Claims 1, 3-8, 10-15 and 18-20 have been rejected under 35 U.S.C. §103(a). Claims 2, 9, 16 and 17 have been objected to as being dependent upon a rejected base claim, but the Examiner has indicated that these claims would be allowable if rewritten in independent form to include the limitations of the base claim and any intervening claims. The rejections are set out in more detail below.

I. Objections to the Specification

The Examiner has objected to the abstract of the disclosure for failure to comply with 37 C.F.R. §1.72(b) which requires the abstract to be under the heading "Abstract of the Disclosure". Applicant has amended the abstract as required.

II. Brief Review of Applicants' Invention

Prior to addressing the Examiner's rejections on the art, a brief review of applicants' invention is appropriate. The invention relates to a method and a system for varying an operating band of an antenna. The method can include magnetically and electrically coupling at least one antenna element to a fluid dielectric, and varying a volume of the fluid dielectric to selectively maximize efficiency of the antenna element on a plurality of operating bands. The fluid dielectric can have values of permittivity and permeability that are greater than one so as to facilitate such operation over a plurality

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of operating bands. For example, the fluid dielectric can include magnetic particles to increase the permeability of the fluid dielectric.

III. Claim Rejections on Art

The Examiner has rejected claims 1, 3-8, 10-15, and 18-20 under 35 U.S.C. §103(a) as being unpatentable over a publication entitled "Patch Antenna Adjustable Frequency Using Liquid Crystal" to Martin, et al. (hereinafter "Martin"), in view of U.S. Patent No. 6,633,161 to Vaughan, Jr. (hereinafter "Vaughan"). Martin discloses a liquid crystal-based patch antenna having an adjustable operating frequency. The patch antenna is disposed on a substrate into which a cavity has been formed. The cavity is then filled with a fixed amount of liquid crystal. Martin discloses that different antenna frequency characteristics were obtained by filling the cavity with different types of liquid crystal having different values of permittivity. Notably, there is not teaching or suggestion to vary the volume of the liquid crystal in the cavity.

Vaughan discloses an RF coil for use in imaging systems, such as nuclear magnetic resonance (NMR) or magnetic resonance imaging (MRI). The RF coil is provided with a single cavity in which a fluid dielectric is disposed. A pump is provided to increase or decrease the quantity of fluid dielectric in the cavity to tune the resonant frequency of the coil.

Amended claim 1 recites, inter alia, magnetically and electrically coupling at least one antenna element to a fluid dielectric comprising magnetic particles. Neither Martin or Vaughan teach or suggest this limitation. The Examiner has asserted that this limitation is taught by Martin because Martin teaches liquid crystal molecules which change orientation under an electromagnetic field of a DC circuit. Applicants

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respectfully disagree. There is no teaching or suggestion in Martin that the liquid crystal molecules are magnetic particles and, indeed, there are many non-magnetic molecules which change orientation under the influence of an electromagnetic field. For instance, water molecules are NOT magnetic molecules, but do change orientation under an electromagnetic field. See, e.g., <http://www.lsbu.ac.uk/water/magnetic.html>.

Accordingly, amended claim 1 is believed to be in condition for allowance.

Claim 7 recites selectively distributing a fluid dielectric to a plurality of separate cavity structures coupled to at least one antenna element to magnetically and electrically couple said at least one antenna element to the fluid dielectric. Thus, by merely opening and closing selected valves, fluid dielectric can be added to selected ones of the cavity structures to vary the volume of fluid dielectric coupled to the antenna elements and thereby change the operating band of the antenna. Martin and Vaughan also fail to teach or suggest this limitation. Specifically, Martin discloses only a single cavity which is coupled to a patch antenna and Vaughan discloses only a single cavity within an RF coil structure into which a fluid dielectric is deposited. Vaughan does disclose structures having multiple cavities, but the cavities are provided to hold test samples to be imaged, such as mice (col. 15, lines 59-62). There is no teaching or suggestion in Vaughan of filling the test sample cavities with the recited fluid dielectric.

Claim 10 recites, inter alia, a fluid control system comprising a controller responsive to a control signal indicating operation on a specified antenna band and to a feedback loop communicating information associated with a performance characteristic of an antenna. The fluid control system selectively varies a volume of fluid dielectric

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coupled to an antenna element to permit efficient operation of the antenna element on a plurality of operating bands.

Neither Martin nor Vaughan disclose, teach or suggest such a fluid control system. To the contrary, the antenna structure disclosed by Martin suggests that the liquid crystal is manually added to the cavity. Although Vaughan discloses a pump that may increase or decrease the quantity of fluid dielectric in the cavity, there is no teaching or indication of Applicants' claimed fluid control system controlling the pump. Indeed, Vaughan does not disclose a controller responsive to any type of control signal, or responsive to a feedback loop communicating information associated with a performance characteristic of an antenna.

IV. Allowable Subject Matter

Claims 2, 9, 16 and 17 have been objected to as being dependent upon a rejected base claim, but are indicated as being allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Claims 2, 16 and 17 have been amended to incorporate the limitations their respective base claims as originally filed. Please charge Deposit Account No. 50-2884 in the amount of \$600 for three independent claims in excess of three. Claim 9 has not been amended to be in independent form. However, claim 9 depends from amended claim 7, which Applicants believe is in condition for allowance. Accordingly, claim 9 is believed to be allowable in its original dependent form.

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V. Conclusion

Applicants have made every effort to present claims which distinguish over the prior art, and it is believed that all claims are in condition for allowance. Nevertheless, Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. In view of the foregoing remarks, Applicants respectfully requests reconsideration and prompt allowance of the pending claims. Please charge any deficiencies or credit any overpayments to Deposit Acct. No. 50-2884.

Respectfully submitted,

3-25-05
Date



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